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# Primary Multidrug-Resistant Tuberculosis in St. Louis City, 1997–99

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This report summarizes four cases of primary multidrug-resistant tuberculosis (MDR-TB) diagnosed in St. Louis City between February 1997 and August 1999. Primary MDR-TB occurs in patients who have not previously been treated for tuberculosis.[1] Three of the four cases described here were culture positive and resistant to INH, RIF and Streptomycin. These cases exemplify the need for heightened awareness of the signs and symptoms of TB in the St. Louis area, especially in emergency care departments. It is likely that there are other cases of MDR-TB yet to be diagnosed, and that these cases will probably initially seek care at emergency departments. Early identification and treatment of MDR-TB is the best way to prevent further transmission.

### Case 1

A 40-year-old man presented to a St. Louis area emergency department and was subsequently hospitalized with flu-like symptoms in February 1997. His chest x-ray revealed prominent hilar adenopathy, diffuse infiltrates in the upper lobes and multiple areas of cavitation. The sputum was found to be positive for acid-fast bacilli with many organisms seen. The patient was immediately started on twice weekly INH, RIF, Pyrazinamide (PZA) and Ethambutol (EMB). At the time of admission, he was noted to be malnourished, co-infected with hepatitis C and negative for HIV. Significant risk factors for active TB included a history of homelessness, alcohol dependence, and non-injecting and injecting drug use. He was unemployed, a smoker and resided both with relatives and in a shelter. He was discharged to the home of a relative and received directly observed therapy (DOT) until he was readmitted for an unrelated complaint on March 8, 1997. His initial culture taken on March 18, 1997, grew *Mycobacterium tuberculosis*. He was subsequently committed by a Health Commissioner's order to the Missouri Rehabilitation Center (MRC) in Mt. Vernon, MO to complete therapy because the relative who had previously taken him in was unwilling to do so again, and it is very difficult to do appropriate follow-up on someone who is homeless. Shortly after arrival at MRC, drug sensitivities revealed resistance to INH, RIF and Streptomycin. His therapy was changed to daily EMB, Ciprofloxacin, Ethionamide, Clofazmine, Capreomycin and PZA. The patient experienced intolerance of some of the medications and therapy was completed with EMB, Ethionamide, Ciprofloxacin and PZA. Serial sputum cultures converted to negative on June 11, 1997, and remained negative through December 3, 1997. He was declared cured and released on December 12, 1997.

After it was discovered that the patient was a contact to Case 2 (see page 2), he was asked to return to the St. Louis City Tuberculosis Clinic on June 15, 1998, for a repeat chest x-ray which showed improvement with resolution of the right upper lobe infiltrate and some residual left upper lobe findings. A sputum culture taken on July 28, 1998, was negative.

In February 1999, the patient again returned to the St. Louis City Tuberculosis Clinic with complaints of cough and night sweats. Another chest x-ray was performed and revealed complete resolution of the previous infiltrates with some left upper lobe scarring. A sputum culture taken on February 19, 1999 was negative. Recent attempts to

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locate and reevaluate the patient have been unsuccessful.

Six household contacts to this case were investigated. Four contacts were skin-test negative at both the initial and three-month evaluations. Two other contacts, both adults, were skin test positive (>15 mm induration) and were initially placed on INH. Their medication was subsequently changed to EMB and PZA. An additional contact, a 9-year-old male, was later identified through a positive routine screening and epidemiologically linked to the first case. The child was treated with 12 months of EMB and PZA.

### Case 2

In the last week of May 1998, a 2-year-old boy was seen by his primary care physician for a routine examination. The child was given a PPD test because the mother's 10-year-old brother had a positive PPD the year before (see Case 1). The skin test result was 15 mm and the boy was referred to a children's hospital for further evaluation. He was residing with his 17-year-old mother and 10-year-old uncle at the home of his paternal grandfather. The location was reported to be a drug house and Case 1 was subsequently identified as an associate of the paternal grandfather. The mother reported no known contact of her son with Case 1, but both the child and Case 1 were frequent occupants of the house. Upon admission to the hospital, the child was found to have a chest x-ray significant for right lung infiltrate and atelectasis. He was mildly anemic with both height and weight below the fifth percentile. An HIV test was negative. He was discharged from the hospital, and he and his mother went to a family shelter where he was to receive DOT.

The child was readmitted to the hospital seven days later in the custody of the Division of Family Services because his mother failed to comply with DOT at the shelter and had returned with the child to the home of her father. During the second admission, the child underwent bronchoscopy and biopsy. All samples, including the original gastric aspirates and urine, were acid-fast bacilli and culture negative. While in the hospital, the boy's connection to Case 1, who was on a daily regimen of INH, RIF, EMB and PZA, was discovered. The boy was then placed on a five-drug regimen consisting of INH, Rifabutin, EMB, PZA and intravenous Amikacin for two months. Therapy with INH, Rifabutin, EMB and PZA was continued for a total of 12 months. At last evaluation in September 1999, he was free of tuberculosis.

### Case 3

A 43-year-old man was admitted to a St. Louis hospital on June 26, 1999, complaining of intermittent nausea, vomiting and diarrhea. He was in his usual state of health until three weeks prior to admission when he developed a productive cough of green sputum, shortness of breath on exertion, shaking chills and night sweats. He also reported a 30 pound weight loss over the same time period with post-tussive emesis that contained blood. The chest x-ray revealed a nodular right upper lobe infiltrate with one large and several smaller cavities. Infiltrates were also noted in the right middle lobe and left lung likely representing active tuberculosis with bronchogenic spread. Significant findings on admission included low-grade fever, cachexia, anemia and hypoalbuminemia. An HIV test was negative. He reported that he had had a negative TB skin test on employment some time in the preceding year. TB was suspected in the emergency department and he was placed in isolation. A sputum smear from June 27, 1999 was 4+ for acid-fast bacilli and he was placed on four-drug therapy with INH, RIF, PZA and EMB. Risk factors for TB included a history of homelessness over the previous three years; however, the patient denied staying in shelters. He admitted to a 15-pack-year smoking habit and past crack cocaine use, but denied ever being incarcerated. The patient also had alcohol dependence and a history of psychiatric problems. He reported no homosexual activity and was not employed in the medical care field. He resided with a friend at the time of diagnosis, but because of his 4+ smear results and extensive contact with relatives and multiple children at that residence, it was decided that he should not return to that residence. He could not remain in the hospital, so he was transferred by Health Commissioner order to MRC on July 2, 1999. While at MRC, drug sensitivities showed resistance to INH, RIF and Streptomycin. He was placed on a regimen of PZA, EMB, Levofloxacin and Ethionamide and is expected to remain at MRC until completion of 12 months of therapy.

Contact investigation for this case identified 25 contacts to date. Two adults were placed on prophylaxis with PZA and EMB. One had a >20 mm PPD and the other was skin-test negative but had a history of alcoholism which is a medical risk factor for a false negative skin test and developing active TB. Fifteen children under the age of 15 years were all initially skin test negative and were placed under a protocol of monthly skin tests and observation. Seven have been PPD tested twice with continued negative results. The remaining children have not undergone further skin testing and efforts to locate them and adult contacts for repeat PPD testing are ongoing. No secondary cases have been identified.

### Case 4

A 58-year-old man who was undergoing alcohol detoxification treatment was transferred to a St. Louis hospital on August 10, 1999, for evaluation of a mental status change and right-sided weakness. The patient had a history of hypertension, evidence of an old lacunar cerebral infract, newly diagnosed hyperglycemia and previous surgery for a chest stab wound. He was confused upon admission and denied all signs and symptoms of tuberculosis. The admission chest x-ray showed two spiculated masses in the right upper lobe with confluent infiltrates. A bulla in the left upper lobe was also detected. A PPD placed upon admission was

17 mm. He denied ever being homeless, staying in a shelter, substance abuse other than alcohol or imprisonment, but reported exposure to a relative from Illinois with a history of tuberculosis. He was unemployed, had a 30-pack-year smoking history and consumed three pints of alcohol nightly. Laboratory results showed borderline anemia, hypoalbuminemia and a negative HIV result. A smear obtained at the time of bronchoscopy was negative. Because of his risk factors and suspicious radiographic findings, the patient underwent bronchoscopy and transbronchial biopsy. He was empirically started on INH, RIF, PZA and EMB. After hospital discharge on August 17, 1999, the patient was not locatable for DOT until August 23, 1999. He cultured positive for *M. tuberculosis* on September 10, 1999, and his sensitivities revealed drug resistance to INH, RIF and Streptomycin on September 22, 1999. He was admitted to MRC on September 22, 1999, and remains there for treatment.

Contact investigation for this case is still in progress and to date no positive contacts have been found. Family members have been refusing follow-up skin tests and other evaluations, which has complicated this investigation. A search of the Illinois TB disease register did not discover the relative from Illinois named as the source of the patient's TB.

### Discussion

The three adult cases discussed in these case scenarios share the same drug resistance pattern, and are the same strain of TB; however, they have not been linked epidemiologically. None of the cases named each other as contacts. Two were hospitalized on the same ward at MRC and did not recognize each other. At the writing of this article, a common source case or cases, or a common site of transmission had not been identified.

The three adult cases do have several demographic characteristics in common. These include alcohol dependence, unemployment (at time of diagnosis or within the last three years), drug use, and homelessness. All three were 40–59 years of age and African-American. Two lived in north St. Louis City and Case 3 lived in south St. Louis City. All were HIV negative. All had no history of previous TB disease, and were considered to be primary MDR-TB cases. They have all been confirmed (through RFLP typing) to have the same strain of TB.[2]

There are at least two reasons to believe that this outbreak of MDR-TB will continue. First, there may be one or more unidentified source case(s) linking the three adult cases that have yet to seek treatment. Cases 1 and 3 were quite advanced, as evidenced by their chest x-rays revealing multiple cavities. It appears that they both had extended periods of illness and had delayed treatment. This is not uncommon. Research of TB cases in Los Angeles County found that lack of employment and of knowledge about where to obtain care were more closely associated with a delay of treatment (>60 days) than was severity of illness. It is likely then that if other MDR-TB cases exist in the St. Louis area with similar demographics, they will also delay treatment, optimizing further spread of disease.[3]

Second, known and unknown social contacts to these three adult cases have the potential to develop MDR-TB. PPD-positive contacts to MDR-TB cases have reduced treatment options. Some of the contacts in these scenarios were treated with PZA and EMB for six months or longer; however, the effectiveness of this treatment is virtually unknown. For this reason, other close contacts are being followed with monthly symptom reviews and PPDs for three months. Tracking known contacts that are transient and have histories of drug use, alcohol abuse and unemployment can be exceedingly difficult and labor intensive and cannot continue indefinitely. At the writing of this article, a contact to Case 3 has exhibited signs and symptoms of TB and is being treated presumptively for MDR-TB. This case may become the fifth case of MDR-TB in the St. Louis area.

The pediatric case discussed as Case 2 illustrates that even well-designed contact investigations may not identify all contacts if source cases are not entirely cooperative and forthcoming with their contacts. However, we do not expect Case 2, because of his age, to contribute to the spread of MDR-TB. Children, particularly those 5-years-old and under, are more likely to develop TB once infected, but they are not likely to be significant sources of transmission. Their respiratory systems are not sufficiently mature to generate the airborne droplet nuclei required for TB transmission.[4] We are concerned that contacts to the three adult cases will develop active disease after the health department has ceased tracking them.

Because of the health hazards associated with exposure to an MDR-TB case, heightened awareness about the signs and symptoms of TB, risk factors for TB (including unemployment and alcohol use) and the need for prompt isolation of potential TB cases is more critical than ever for St. Louis area emergency departments and hospitals. An algorithm developed by Harbor-UCLA Hospital[5] and suggested for use by emergency departments is reprinted on page 5. The St. Louis City Health Department, the Missouri Department of Health, the American Lung Association of Eastern Missouri, and other St. Louis area health care providers are working closely together on a comprehensive plan to halt further transmission of MDR-TB in the St. Louis area and statewide. See related article on page 4.

**Suspected cases of TB should be reported to your local public health agency within 24 hours.**

If you have questions about TB, contact your local public health agency or the Missouri Department of Health, Section of Vaccine-Preventable and Tuberculosis Disease Elimination at (800) 611-2912.

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# Follow-Up of Multidrug-Resistant Tuberculosis in St. Louis

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The fact that there have been four cases of multi-drug resistant tuberculosis (MDR-TB) is important for the St. Louis area. A contact to one of the four cases is being followed and may or may not become the fifth case of MDR-TB in the St. Louis area. Although the absolute number is small, there have been 156 cases of tuberculosis (TB) disease over the same period of time. It points to the need to be as aggressive as possible in preventing, identifying and successfully treating such cases. Given a rising number of immigrants from areas of the world where MDR-TB is endemic and diminishing funds for critical TB control activity, it is important to call attention to this threat as soon as possible. There is no better time than now.

The risk factors for the development of TB and MDR-TB must be reviewed periodically.[1] They should serve as the basis for a high clinical index of suspicion when caring for patients who might be affected. General risk factors include living in crowded institutional settings (e.g., prisons), poverty, immigration from TB-endemic areas, HIV positive status, homelessness, and poor adherence to TB treatment protocols. A suboptimal or deteriorating infrastructure of public health TB-surveillance, epidemiology and control contributes to the risk of transmitting TB. The rise in TB cases nationally from 1985 to 1992 was largely due to an increase in MDR-TB infected persons who were also HIV infected in institutional settings.[2]

To assist in addressing the MDR-TB problem, the St. Louis City Health Department is developing a five-year strategic plan for TB elimination. In addition, the department is reviewing programs to assure that all TB cases are diagnosed. This includes enhanced education and awareness programs for providers and managed care plans, as well as for the public. The department will also work to assure that individuals with TB are effectively treated using directly observed therapy (DOT).

Prompt and effective contact investigation activities, as well as identification and treatment of persons with latent TB or who are otherwise at high risk for TB, have been enhanced by hiring additional staff (nurses). Complete and timely reporting of all TB cases is essential. Surveillance of incarcerated, homeless and mentally ill populations is being performed. Enhanced and regular training of staff has been implemented. Indicators and evaulation measures are being developed to monitor programmatic and operational performance.

Broader collaborations with community-based organizations that provide services to persons who are at risk for TB are being developed. Continued participation in collaborative public health research is also important.

A false sense of complacency about the total number of TB cases must also be avoided. In 1999, there were 41 cases of TB, a 25 percent reduction compared to 1998, and a 32 percent reduction compared to 1997. TB elimination will require continued and aggressive activities and resources. We face a 19 percent reduction in TB prevention and control funding for the next fiscal year. Accordingly, more creative funding strategies must be pursued while working cooperatively with the Missouri Department of Health to persuade the Centers for Disease Control and Prevention (CDC) and national policy makers to increase funding. We must also work to assure that existing funds are efficiently utilized.

MDR-TB is emerging again. Let's take steps to stop it now.

**REFERENCES:**

1. CDC. Tuberculosis elimination revisited: Obstacles, opportunities and a renewed commitment. MMWR 1999;48(RR-9):1–13.
2. CDC. Nosocomial transmission of multidrug-resistant tuberculosis among HIV-infected persons—Florida and New York, 1988 –1991. MMWR 1991;40(34):585–91.

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## Multidrug-Resistant Tuberculosis

*(continued from page 3)*
**REFERENCES:**

1. Raviglione MC, Snider DE, Kochi A. Global epidemiology of tuberculosis, morbidity and mortality of a worldwide epidemic. JAMA 1995; 27:220–26.
2. Missouri Department of Health (Jan. 6, 2000). Report of DNA fingerprint results.
3. Asch S, Leake B, Anderson R, Gelberg L. Why do symptomatic patients delay obtaining care for tuberculosis? Am J Respir Crit Care Med 1998; 157:1244–48.
4. Stark, J. Pediatric Tuberculosis Course Syllabus. Tuberculosis 2000: Fundamentals of Clinical Tuberculosis and Tuberculosis Control Satellite Conference. January 23, 30 and February 6, 1997.
5. Francis J. Curry National Tuberculosis Center, Institutional Consultation Services. A guideline for establishing effective practices: Identifying persons with infectious TB in the emergency department. 1998:[14].
**http://www.nationaltbcenter.edu/ics/ICS.pdf**

# Harbor-UCLA Triage Criteria for Respiratory Isolation Tuberculosis Precautions (RIPT)

Chief Complaint: _____ Date: _____

**CHECK ALL APPLICABLE RISK FACTORS, SYMPTOMS, OR COMPLAINTS:**

**Risk Factors**

- ☐ (2) HIV Positive
- ☐ (1) Male Homosexual
- ☐ (1) Foreign-Born
- ☐ (2) Homeless or In Shelter
- ☐ (1) IVDA
- ☐ (4) History of Active TB Now or at Any Time In the Past (even if on meds)
- ☐ (2) In Jail Within Last 2 Years
- ☐ (2) Newly PPD Positive (within 2 years) or History of Recent TB Exposure

**Symptoms/Complaints**

- ☐ (3) Cough (any duration)
- ☐ (2) Fever or Chills or Night Sweats
- ☐ (2) Weight Loss >10 Pounds
- ☐ (5) Hemoptysis

**Total Points:** _____

## RIPT for 5 or more points

Add up points. Respiratory Isolation scale scores of 5 or more points indicate a need for immediate mask and respiratory isolation packet (RIPT Packet). For patients meeting criteria, please order a PA and lateral chest X-ray and have an emergency medicine senior resident or emergency medicine attending physician record their reading of the chest X-ray and their decision regarding the need for continued isolation below. This form should be attached to the nursing notes for the patient and, when the chart is broken down, returned to the envelope by the clerk's desk. All patients with scores of 5 or more must be entered in the RIPT logbook.

Complete below only for patient meeting RIPT criteria:

Name: _____
Last First MI

Assigned RIPT Number: _____

**Chest X-ray result (to be recorded by physician reading film, check all that apply):**

- ☐ Upper Lobe Infiltrate(s)
- ☐ Diffuse Infiltrate or Interstitial Pattern
- ☐ Mediastinal Lymphadenopathy
- ☐ Other Findings (hyperinflation, rib fractures, etc.)
- ☐ Normal
- ☐ Infiltrate Not in Upper Lobe(s)
- ☐ Pleural Effusion
- ☐ Mass or Coin Lesion (not cavitary)
- ☐ Cavitary Lesion

Source: A Guide for Establishing Effective Practices: Identifying Persons With Infectious TB in the Emergency Department, 1998
Published by National Tuberculosis Center, Institutional Consultation Services

# Missourians Infected With *Ehrlichia ewingii* Causing Human Granulocytic Ehrlichiosis

*H. Denny Donnell, Jr., M.D., M.P.H.*
*Office of Epidemiology*

Last summer researchers from Washington University published in the New England Journal of Medicine an article summarizing four patients in Missouri suffering from infections with *Ehrlichia ewingii*. This agent was first known to infect dogs. The illnesses in the Missouri patients were febrile, with headache and thrombocytopenia. Two of the four had leukopenia. One had myalgia and a stiff neck and one had abnormal liver function tests. They ranged in age from 11 to 65, were all male, all gave a history of exposure to ticks and all responded well to doxycycline. Three were on immunosuppressive therapy, each for a different reason. The illnesses occurred in the months of May through August of 1996, 1997 and 1998. These cases were laboratory confirmed using polymerase-chain-reaction (PCR) and by nucleotide sequencing. The sequences were all identical, different from the sequence of *Ehrlichia chaffeensis* and matched the sequence of *E. ewingii*. Morulae were found in the granulocytes of two patients. In three of the patients whose convalescent sera were tested by indirect immunofluorescence assay high titers were found for *E. chaffeensis*, but western blot analysis demonstrated that these were cross reactions with *E. ewingii*.

The form of ehrlichiosis known to be prevalent in Missouri and vicinity before this report was human monocytic ehrlichiosis (HME) caused by *E. chaffeensis* and showing morulae in the monocytes. Figure 1 shows the incidence of ehrlichiosis in Missouri from 1988–1999. The causative agent of these cases is not available. Figure 2 shows the location of ehrlichiosis cases by county for 1997–98. Data for 1999 are still provisional; final figures will be included in the 1999 tick-borne disease summary scheduled for publication in the May-June 2000 issue of this newsletter.

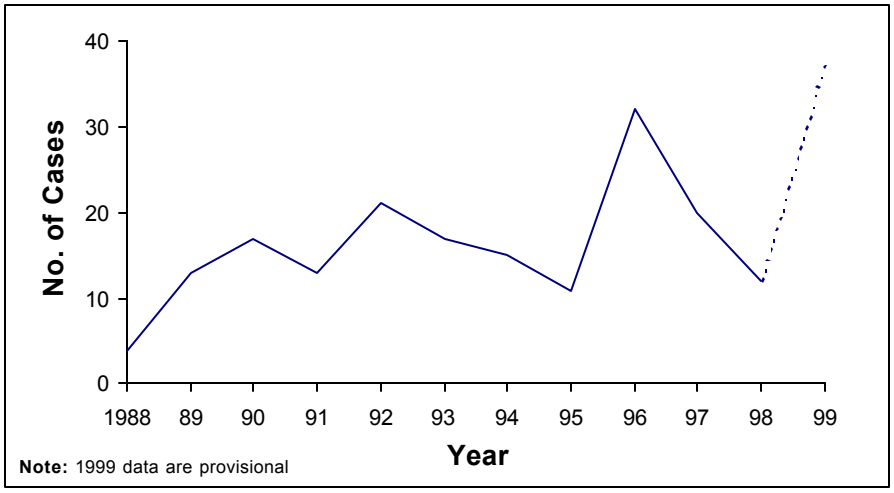


Figure 1. Reported ehrlichiosis cases by year of report, Missouri, 1988–99.

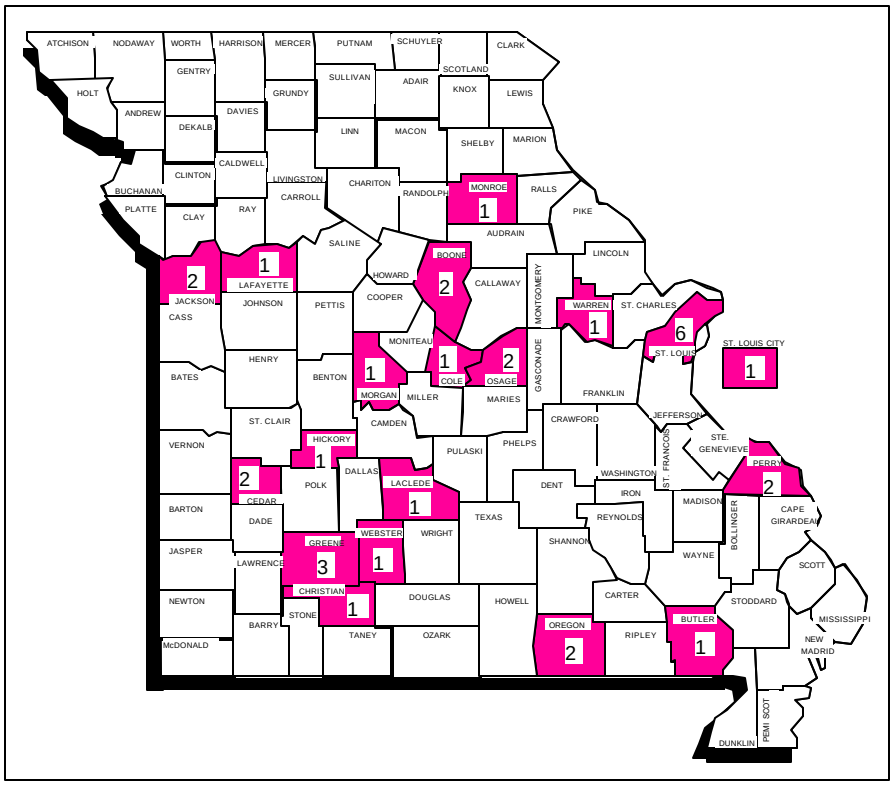


Figure 2. Reported ehrlichiosis cases by county, Missouri, 1997–98.

In other parts of the country, human granulocytic ehrlichiosis (HGE) has been caused by an as yet unidentified agent similar to *E. equi* and *E. phagocytophila*, often referred to as the "agent of HGE." PCR tests on these four patients were negative for the "agent of HGE." The vector of *E. chaffeensis* in Missouri is the Lone Star Tick (*Amblyomma*

*americanum*). This same tick is known to vector the *E. ewingii* in dogs. The vector for the agent of HGE in other parts of the United States is *Ixodes scapularis*.

Illnesses with ehrlichiosis infection range from very mild to life threatening and fatal. The incubation period ranges from 7 to 21 days. Patients may complain of fever, headache, myalgia, loss of appetite, nausea and vomiting. Leukopenia, thrombocytopenia and elevation of liver enzymes may be found. Inclusion bodies known as morulae may be seen in white blood cells on blood or buffy coat smears. A four-fold titer rise or fall with acute and convalescent sera is diagnostic. At the present time, it is thought that the human illnesses caused by the various *Ehrlichia* agents are clinically indistinquishable, and all forms respond to doxycycline therapy.

Prevention involves avoidance of ticks by avoidance of their habitat or by use of tick repellant and protective clothing when exposure is unavoidable. Dogs may participate in the transmission cycle, and should be avoided to the extent possible. Close examination of the skin to permit removal of ticks is advisable after exposure to potential tick-infested areas or to tick-infested dogs.

Clinicians should keep these syndromes in their differential diagnosis of febrile illness in the warmer months of the year, especially in immunosuppressed patients. The public should be reminded that other illnesses are also carried by ticks, including the more common, but serious and potentially fatal Rocky Mountain spotted fever and tularemia as well as borreliosis (Lyme or Lyme-like disease) and babesiosis.

For laboratory testing, serum specimens (acute and convalescent drawn four weeks apart) should be submitted to the State Public Health Laboratory. They will forward the specimens on to the Centers for Disease Control and Prevention (CDC) for testing. Please contact the State Public Health Laboratory at (573) 751-0633 to obtain submission form and instructions.

Ehrlichiosis is reportable in Missouri, and should be reported to your local public health agency within three days of first knowledge or suspicion. If you have questions about ehrlichiosis, please contact the Section of Communicable Disease Control and Veterinary Public Health at (800) 392-0272.

**REFERENCES:**


1. Buller RS, Arens M, Hmiel SP, et al. *Ehrlichia ewingii*, a newly recognized agent of human ehrlichiosis. N Engl J Med 1999;341(3):148–55.
2. Chin J. Control of communicable diseases manual. Washington, DC: American Public Health Association, 2000.


# Food That's In When School Is Out!

## Summer Food Service Program

Researchers at the National Center on Hunger and Poverty at Tufts University in Boston report that recent years of exceptional economic growth have failed to produce a commensurate reduction in food insecurity and hunger. "For the first time in modern history," reports center director Dr. J. Larry Brown, "the prevalence of hunger seems stubbornly impervious to economic growth. At the peak of the longest economic boom in our history, over 30 million people live in households that experience hunger and food insecurity—about the same number as four years ago."

During the school year, the National School Lunch Program offers meals at free or reduced prices. Many children from households that experience hunger and food insecurity participate in this national program, but, during the summer months, there are many who do not receive an adequate diet. The Summer Food Service Program is available to organizations to support efforts in combating food insecurity in the community. Combining the Summer Food Service Program with summer enrichment programs could truly help those who need it most. A student who consumes nutritionally adequate meals will be better prepared to learn.

With summer approaching quickly, we invite you to learn more about the exciting opportunities that abound in the Summer Food Service Program. For more information, please call the Department of Health, Bureau of Nutrition and Child Care Programs at (888) 435-1464.

# Recommended Childhood Immunization Schedule—United States, 2000

*Reprinted from the Centers for Disease Control and Prevention Morbidity and Mortality Weekly Report (MMWR), January 21, 2000, Vol. 49, No. 2.*

Each year, CDC's Advisory Committee on Immunization Practices (ACIP) reviews the recommended childhood immunization schedule to ensure it remains current with changes in manufacturers' vaccine formulations, revisions in recommendations for the use of licensed vaccines, and recommendations for newly licensed vaccines. This report presents the recommended childhood immunization schedule for 2000 and explains the changes that have occurred since January 1999. See immunization schedule on pages 9–10.

Since the publication of the immunization schedule in January 1999[1], ACIP, the American Academy of Family Physicians, and the American Academy of Pediatrics have recommended removal of rotavirus vaccine from the schedule, endorsed an all-inactivated poliovirus vaccine (IPV) schedule for polio vaccination, recommended exclusive use of acellular pertussis vaccines for all doses of the pertussis vaccine series, and added hepatitis A vaccine (Hep A) to the schedule to reflect its recommended use in selected geographic areas.[2] Detailed recommendations for using vaccines are available from the manufacturers' package inserts, ACIP statements on specific vaccines, and the 1997 Red Book.[3] ACIP statements for each recommended childhood vaccine can be viewed, downloaded, and printed at CDC's National Immunization Program World-Wide Web site, **http://www.cdc.gov/nip/publications/acip-list.htm**.

### Removal of Rotavirus Vaccine From the Schedule

On October 22, 1999, ACIP recommended that Rotashield®* (rhesus rotavirus vaccine-tetravalent [RRV-TV]) (Wyeth Laboratories, Inc., Marietta, Pennsylvania), the only U.S. licensed rotavirus vaccine, no longer be used in the United States.[4] The decision was based on the results of an expedited review of scientific data presented to ACIP by CDC. Data from the review indicated a strong association between RRV-TV and intussusception among infants 1–2 weeks following vaccination. Vaccine use was suspended in July pending the ACIP data review. Parents should be reassured that children who received the rotavirus vaccine before July are not at increased risk for intussusception now. The manufacturer withdrew the vaccine from the market in October.

### Inactivated Poliovirus Vaccine for All Four Doses

As the global eradication of poliomyelitis continues, the risk for importation of wild-type poliovirus into the United States decreases dramatically. To eliminate the risk for vaccine-associated paralytic poliomyelitis (VAPP), an all-IPV schedule is recommended for routine childhood vaccination in the United States.[5] All children should receive four doses of IPV: at age 2 months, age 4 months, between ages 6 and 18 months, and between ages 4 and 6 years. Oral poliovirus vaccine (OPV), if available, may be used only for the following special circumstances:

1. Mass vaccination campaigns to control outbreaks of paralytic polio.
2. Unvaccinated children who will be traveling within 4 weeks to areas where polio is endemic or epidemic.
3. Children of parents who do not accept the recommended number of vaccine injections; these children may receive OPV only for the third or fourth dose or both. In this situation, health-care providers should administer OPV only after discussing the risk for VAPP with parents or caregivers.

OPV supplies are expected to be very limited in the United States after inventories are depleted. ACIP reaffirms its support for the global eradication initiative and use of OPV as the vaccine of choice to eradicate polio where it is endemic.

### Acellular Pertussis Vaccine

ACIP recommends exclusive use of acellular pertussis vaccines for all doses of the pertussis vaccine series. The fourth dose may be administered as early as age 12 months, provided 6 months have elapsed since the third dose and the child is unlikely to return at 15–18 months.

### Hepatitis A

Hepatitis A vaccine (Hep A) is listed on the schedule for the first time because it is recommended for routine use in some states and regions. Its appearance on the schedule alerts providers to consult with their local public health authority to learn the current recommendations for hepatitis A vaccination in their community. Additional information on the use of Hep A can be found in recently published guidelines.[2]

**Editor's Note:** The ACIP recommends that children receive routine vaccination against hepatitis A in states with high rates of hepatitis A incidence. Missouri children should routinely receive hepatitis A vaccination at the appropriate age.

### Hepatitis B

Special considerations apply in the selection of hepatitis B vaccine products for the dose administered at birth.[6]

*(continued on page 13)*

* Use of trade names and commercial sources is for identification only and does not constitute or imply endorsement by CDC or the U.S. Department of Health and Human Services.

# Recommended Childhood Immunization Schedule
# United States, January - December 2000

*Vaccines[1] are listed under routinely recommended ages. Bars indicate range of recommended ages for immunization. Any dose not given at the recommended age should be given as a "catch-up" immunization at any subsequent visit when indicated and feasible. Ovals indicate vaccines to be given if previously recommended doses were missed or given earlier than the recommended minimum age.*

| Age ▶ / Vaccine ▼ | Birth | 1 mo | 2 mos | 4 mos | 6 mos | 12 mos | 15 mos | 18 mos | 24 mos | 4-6 yrs | 11-12 yrs | 14-16 yrs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hepatitis B[2] | Hep B | | | | | | | | | | | |
| | | Hep B | | | | | | | | | Hep B | |
| | | | | | Hep B | | | | | | | |
| Diphtheria, Tetanus, Pertussis[3] | | | DTaP | DTaP | DTaP | | DTaP[3] | | | DTaP | Td | |
| *H. influenzae* type b[4] | | | Hib | Hib | Hib | Hib | | | | | | |
| Polio[5] | | | IPV | IPV | IPV[5] | | | | | IPV[5] | | |
| Measles, Mumps, Rubella[6] | | | | | | MMR | | | | MMR[6] | MMR[6] | |
| Varicella[7] | | | | | | Var | | | | | Var[7] | |
| Hepatitis A[8] | | | | | | | | | Hep A[8]-in selected areas | | | |

**Approved by the Advisory Committee on Immunization Practices (ACIP), the American Academy of Pediatrics (AAP), and the American Academy of Family Physicians (AAFP).**

*On October 22, 1999, the Advisory Committee on Immunization Practices (ACIP) recommended that Rotashield® (RRV-TV), the only U.S.-licensed rotavirus vaccine, no longer be used in the United States (MMWR, Volume 48, Number 43, Nov. 5, 1999). Parents should be reassured that their children who received rotavirus vaccine before July are not at increased risk for intussusception now.*

1 This schedule indicates the recommended ages for routine administration of currently licensed childhood vaccines as of 11/1/99. Additional vaccines may be licensed and recommended during the year. Licensed combination vaccines may be used whenever any components of the combination are indicated and its other components are not contraindicated. Providers should consult the manufacturers' package inserts for detailed recommendations.

2 **Infants born to HBsAg-negative mothers** should receive the 1st dose of hepatitis B (Hep B) vaccine by age 2 months. The 2nd dose should be at least one month after the 1st dose. The 3rd dose should be administered at least 4 months after the 1st dose and at least 2 months after the 2nd dose, but not before 6 months of age for infants.
**Infants born to HBsAg-positive mothers** should receive hepatitis B vaccine and 0.5 mL hepatitis B immune globulin (HBIG) within 12 hours of birth at separate sites. The 2nd dose is recommended at 1 month of age and the 3rd dose at 6 months of age.
**Infants born to mothers whose HBsAg status is unknown** should receive hepatitis B vaccine within 12 hours of birth. Maternal blood should be drawn at the time of delivery to determine the mother's HBsAg status; if the HBsAg test is positive, the infant should receive HBIG as soon as possible (no later than 1 week of age).
**All children and adolescents (through 18 years of age)** who have not been immunized against hepatitis B may begin the series during any visit. Special efforts should be made to immunize children who were born in or whose parents were born in areas of the world with moderate or high endemicity of hepatitis B virus infection.

3 The 4th dose of DTaP (diphtheria and tetanus toxoids and acellular pertussis vaccine) may be administered as early as 12 months of age, provided 6 months have elapsed since the 3rd dose and the child is unlikely to return at age 15-18 months. Td (tetanus and diphtheria toxoids) is recommended at 11-12 years of age if at least 5 years have elapsed since the last dose of DTP, DTaP or DT. Subsequent routine Td boosters are recommended every 10 years.

4 Three *Haemophilus influenzae* type b (Hib) conjugate vaccines are licensed for infant use. If PRP-OMP (PedvaxHIB® or ComVax® [Merck]) is administered at 2 and 4 months of age, a dose at 6 months is not required. Because clinical studies in infants have demonstrated that using some combination products may induce a lower immune response to the Hib vaccine component, DTaP/Hib combination products should not be used for primary immunization in infants at 2, 4 or 6 months of age, unless FDA-approved for these ages.

5 To eliminate the risk of vaccine-associated paralytic polio (VAPP), an all-IPV schedule is now recommended for routine childhood polio vaccination in the United States. All children should receive four doses of IPV at 2 months, 4 months, 6-18 months, and 4-6 years. OPV (if available) may be used only for the following special circumstances:

1. Mass vaccination campaigns to control outbreaks of paralytic polio.
2. Unvaccinated children who will be traveling in <4 weeks to areas where polio is endemic or epidemic.
3. Children of parents who do not accept the recommended number of vaccine injections. These children may receive OPV only for the third or fourth dose or both; in this situation, health-care providers should administer OPV only after discussing the risk for VAPP with parents or caregivers.
4. During the transition to an all-IPV schedule, recommendations for the use of remaining OPV supplies in physicians' offices and clinics have been issued by the American Academy of Pediatrics (see *Pediatrics*, December 1999).

6 The 2nd dose of measles, mumps, and rubella (MMR) vaccine is recommended routinely at 4-6 years of age but may be administered during any visit, provided at least 4 weeks have elapsed since receipt of the 1st dose and that both doses are administered beginning at or after 12 months of age. Those who have not previously received the second dose should complete the schedule by the 11-12 year old visit.

7 Varicella (Var) vaccine is recommended at any visit on or after the first birthday for susceptible children, i.e. those who lack a reliable history of chickenpox (as judged by a health care provider) and who have not been immunized. Susceptible persons 13 years of age or older should receive 2 doses, given at least 4 weeks apart.

8 Hepatitis A (Hep A) is shaded to indicate its recommended use in selected states and/or regions. The ACIP recommends that children receive routine vaccination against hepatitis A in states with high rates of hepatitis A incidence. Missouri children should routinely receive hepatitis A vaccination at the appropriate age. (Also see *MMWR* Oct. 01, 1999/48(RR12);1-37.)

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**KEY**

| | |
|---|---|
| J/F99 | = January/February 1999 |
| M/A99 | = March/April 1999 |
| M/J99 | = May/June 1999 |
| J/A99 | = July/August 1999 |
| S/O99 | = September/October 1999 |
| N/D99 | = November/December 1999 |

# Department of Health Study Finds African Americans at Greater Risk for Cardiovascular Disease

*Diana Hawkins*
*Cardiovascular Health Program*

A recent study by the Missouri Department of Health has found that African Americans in three regions of Missouri have risk factors that increase their vulnerability to cardiovascular disease (heart disease and stroke), which is the leading cause of death and disability in the state.

The study looked at risk factors for cardiovascular disease (CVD) including smoking, physical inactivity, obesity, hypertension and unmonitored cholesterol, in the three areas of the state with the highest populations of African Americans – St. Louis City, Kansas City and the Bootheel area.

According to the findings, African Americans in these areas were more likely than the state average to have risk factors for CVD.

For example, the study revealed that in 1996 the rate of obesity among African American females was more than twice the rate among other women statewide.

The report documents that during the years studied, 1990 through 1996, there was no improvement in any of the risk factors for African American males although there was a decrease in physical inactivity among African American females. Positive findings among other groups include an increase in physical activity among white females and a decrease in hypertension (high blood pressure) among white women age 18–34.

This study indicates a need for concern because cardiovascular disease is the major killer in this state, and many African Americans appear to be at increased risk for CVD. This study will enable the department to better direct its resources to help Missourians decrease their risk of dying from heart disease.

Missouri has a grant from the Centers for Disease Control and Prevention (CDC) to develop a comprehensive state plan to reduce the risk factors for CVD in Missouri. The plan, which will be implemented this winter, will have an emphasis on addressing risk factors impacting African Americans.

Following are additional facts about cardiovascular disease in Missouri:

- Heart disease and stroke killed 174,640 Missourians between 1990 and 1997.
- Hospitalization expenditures relating to CVD cost Missouri more than one billion dollars in 1997 alone.
- During the study period, the three-region study population had a higher overall prevalence of smoking, obesity, hypertension and unmonitored cholesterol than the overall prevalence for the state of Missouri.
- Between 1990 and 1996, the overall prevalence of obesity increased in the study population, especially among African-American females.

A copy of the study, *Changes in Prevalence of Modifiable Cardiovascular Disease Risk Factors in Three Regions of Missouri, 1990–1996*, is available by contacting Diana Hawkins, Manager, Cardiovascular Health Program, at (573) 876-3207.

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## 2000 Immunization Schedule

*(continued from page 8)*

**Vaccine Information Statements**

The National Childhood Vaccine Injury Act requires that all health-care providers, whether public or private, give to parents or patients copies of Vaccine Information Statements before administering each dose of the vaccines listed in this schedule (except Hep A). Vaccine Information Statements, developed by CDC, can be obtained from state health departments and CDC's World-Wide Web site, **http://www.cdc.gov/ nip/ publications/VIS**. Instructions on use of the Vaccine Information Statements are available from CDC's website or the December 17, 1999, Federal Register (64 FR 70914).

**REFERENCES:**

1. CDC. Recommended childhood immunization schedule—United States, 1999. MMWR 1999; 48: 12–6.
2. CDC. Prevention of hepatitis A through active or passive immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 1999;48(no. RR-12).
3. American Academy of Pediatrics. Active and passive immunization. In: Peter G, ed. 1997 Red book: report of the Committee on Infectious Diseases. 24th ed. Elk Grove Village, Illinois: American Academy of Pediatrics 1997:1–71.
4. CDC. Withdrawal of rotavirus vaccine recommendation. MMWR 1999;48:1007.
5. CDC. Recommendations of the Advisory Committee on Immunization Practices: revised recommendations for routine poliomyelitis vaccination. MMWR 1999;48:590.
6. CDC. Recommendations regarding the use of vaccines that contain thimerosal as a preservative. MMWR 1999;48:996–8.

# Achievements in Public Health, 1900–1999: Changes in the Public Health System

*Reprinted from the Centers for Disease Control and Prevention Morbidity and Mortality Weekly Report (MMWR), December 24, 1999, Vol. 48, No. 50. As indicated in the article, this is just one of a series of articles published in the MMWR relating to achievements in public health, 1900–1999. The MMWR is available electronically and those issues can be found at* **http://www2.cdc.gov/mmwr/index99.htm.**

**Ten Great Public Health Achievements United States, 1900–1999**

- Vaccination
- Motor-Vehicle Safety
- Safer Workplaces
- Control of Infectious Diseases
- Decline in Deaths From Coronary Heart Disease and Stroke
- Safer and Healthier Foods
- Healthier Mothers and Babies
- Family Planning
- Fluoridation of Drinking Water
- Recognition of Tobacco Use as a Health Hazard

The 10 public health achievements highlighted in this MMWR series (see box) reflect the successful response of public health to the major causes of morbidity and mortality of the 20th century.[1-11] In addition, these achievements demonstrate the ability of public health to meet an increasingly diverse array of public health challenges. This report highlights critical changes in the U.S. public health system this century.

In the early 1900s in the United States, many major health threats were infectious diseases associated with poor hygiene and poor sanitation (e.g., typhoid), diseases associated with poor nutrition (e.g., pellagra and goiter), poor maternal and infant health, and diseases or injuries associated with unsafe workplaces or hazardous occupations.[4,5,7,8] The success of the early public health system to incorporate biomedical advances (e.g., vaccinations and antibiotics) and to develop interventions such as health education programs resulted in decreases in the impact in these diseases. However, as the incidence of these diseases decreased, chronic diseases (e.g., cardiovascular disease and cancer) increased.[6,10] In the last half of the century, public health identified the risk factors for many chronic diseases and intervened to reduce mortality. Public efforts also led to reduced deaths attributed to a new technology, the motor vehicle.[3] These successes demonstrated the value of community action to address public health issues and have fostered public support for the growth of institutions that are components of the public health infrastructure*. The focus of public health research and programs shifted to respond to the effects of chronic diseases on the public's health.[12-17] While continuing to develop and refine interventions, enhanced morbidity and mortality surveillance helped to maintain these earlier successes. The shift in focus led to improved capacity of epidemiology and to changes in public health training and programs.

### Quantitative Analytic Techniques

Epidemiology, the population-based study of disease and an important part of the scientific foundation of public health, acquired greater quantitative capacity during the 20th century. Improvements occurred in both study design and periodic standardized health surveys.[12,18-21] Methods of data collection evolved from simple measures of disease prevalence (e.g., field surveys) to complex studies of precise analyses (e.g., cohort studies, case-control studies, and randomized clinical trials).[12] The first well-developed, longitudinal cohort study was conducted in 1947 among the 28,000 residents of Framingham, Massachusetts, many of whom volunteered to be followed over time to determine incidence of heart disease.[12] The Framingham Heart Study served as the model for other longitudinal cohort studies and for the concept that biologic, environmental, and behavioral risk factors exist for disease.[6,12]

In 1948, modern clinical trials began with publication of a clinical trial of streptomycin therapy for tuberculosis, which employed randomization, selection criteria, pre-determined evaluation criteria, and ethical consideration.[19,21] In 1950, the case-control study gained prominence when this method provided the first solidly scientific evidence of an association between lung cancer and cigarette smoking.[22] Subsequently, high-powered statistical tests and analytic computer programs enabled multiple variables collected in large-scale studies to be measured and to the development of tools for mathematical modeling. Advances in epidemiology permitted elucidation of risk factors for

* The government, community, professional, voluntary, and academic institutions and organizations that support or conduct public health research or programs.

heart disease and other chronic diseases and the development of effective interventions.

### Periodic Standardized Health Surveys

In 1921, periodic standardized health surveys began in Hagerstown, Maryland.[12] In 1935, the first national health survey was conducted among U.S. residents.[12,23] In 1956, these efforts resulted in the National Health Survey, a population-based survey that evolved from focusing on chronic disease to estimating disease prevalence for major causes of death, measuring the burden of infectious diseases, assessing exposure to environmental toxicants, and measuring the population's vaccination coverage. Other population-based surveys (e.g., Behavioral Risk Factor Surveillance System, Youth Risk Behavior Survey, and the National Survey of Family Growth) were developed to assess risk factors for chronic diseases and other conditions.[24-26] Methods developed by social scientists and statisticians to address issues such as sampling and interviewing techniques have enhanced survey methods used in epidemiologic studies.[12]

### Morbidity and Mortality Surveillance

National disease monitoring was first conducted in the United States in 1850, when mortality statistics based on death registrations were first published by the federal government.[23,27] During 1878-1902, Congress authorized the collection of morbidity reports on cholera, smallpox, plague, and yellow fever for use in quarantine measures, to provide funds to collect and disseminate these data, to expand authority for weekly reporting from states and municipal authorities, and to provide forms for collecting data and publishing reports.[15,23,27] The first annual summary of *The Notifiable Diseases* in 1912 included reports of 10 diseases from 19 states, the District of Columbia, and Hawaii. By 1928, all states, the District of Columbia, Hawaii, and Puerto Rico were participating in the national reporting of 29 diseases. In 1951, state and territorial health officers authorized the Council of State and Territorial Epidemiologists (CSTE) to determine which diseases should be reported to the U.S. Public Health Service (PHS).[27] In 1961, the Centers for Disease Control and Prevention (CDC) assumed responsibility for collecting and publishing nationally notifiable diseases data. As of January 1, 1998, 52 infectious diseases were notifiable at the national level.

In the early 1900s, efforts at surveillance focused on tracking persons with disease; by mid-century, the focus had

*(continued on page 16)*

## National Public Health Week
## April 3–9, 2000

National Public Health Week will be recognized in Missouri and around the nation April 3–9, 2000. The theme of National Public Health Week, "Healthy People in Healthy Communities," is also the vision of the Healthy People 2010. Healthy People 2010, the nation's health objectives for the first decade of the new century, were released on January 25, 2000 at the Partnerships for Health in the New Millennium Conference in Washington, D.C. Healthy People objectives have served as the nation's report card for measuring progress in health promotion and disease prevention since the initiative began in 1979.

The Missouri Public Health Association, in collaboration with the Missouri Department of Health and the Colgate Palmolive Company, is coordinating, again this year, hand-washing education in Head Start locations across the state. Last year's effort was very successful in teaching young children healthy habits, as well as raising awareness of local public health efforts. The goal this year is to get all local public health services to participate, and to educate the 15,500 children enrolled in Head Start Education Sites across the state the importance of handwashing as a good health habit.

While most people don't think about it, local public health services have an impact on almost everything we do in a day. From giving immunizations to children, to inspecting restaurants for sanitation, providing birth certificates and testing the quality of well water, public health touches all aspects of our health and safety.

For more information, please contact your local public health service or Mary Jo Hall, Missouri Public Health Association Public Health Week Coordinator at (816) 525-5341.

*(continued from page 15)*
changed to tracking trends in disease occurrence.[28,29] In 1947, Alexander Langmuir at the newly formed Communicable Disease Center, the early name for CDC, began the first disease surveillance system.[27] In 1955, surveillance data helped to determine the cause of poliomyelitis among children recently vaccinated with an inactivated vaccine.[28] After the first polio cases were recognized, data from the national polio surveillance program confirmed that the cases were linked to one brand of vaccine contaminated with live wild poliovirus. The national vaccine program continued by using supplies from other polio vaccine manufacturers.[28] Since these initial disease surveillance efforts, morbidity tracking has become a standard feature of public health infectious disease control.[29]

## Public Health Training

In 1916, with the support of the Rockefeller Foundation, the Johns Hopkins School of Hygiene and Public Health was started.[30,31] By 1922, Columbia, Harvard, and Yale universities had established schools of public health. In 1969, the number of schools of public health had increased to 12, and in 1999, 29 accredited schools of public health enrolled approximately 15,000 students.[31,32] Besides the increase in the number of schools and students, the types of student in public health schools changed. Traditionally, students in public health training already had obtained a medical degree. However, increasing numbers of students entered public health training to obtain a primary postgraduate degree. In 1978, 3753 (69%) public health students enrolled with only baccalaureates. The proportion of students who were physicians declined from 35% in 1944–1945 to 11% in 1978.[28,31] Thus, public health training evolved from a second degree for medical professionals to a primary health discipline.[33] Schools of public health initially emphasized the study of hygiene and sanitation; subsequently, the study of public health has expanded into five core disciplines: biostatistics, epidemiology, health services administration, health education/behavioral science, and environmental science.[30,34]

Programs also were started to provide field training in epidemiology and public health. In 1948, a board was established to certify training of physicians in public health administration, and by 1951, approximately 40 local health departments had accredited preventive medicine and public residency programs. In 1951, CDC developed the Epidemic Intelligence Service (EIS) to guard against domestic acts of biologic warfare during the Korean conflict and to address common public health threats. Since 1951, more than 2000 EIS officers have responded to requests for epidemiologic assistance within the United States and throughout the world. In 1999, 149 EIS officers are on duty.

## Nongovernment and Government Organizations

At the beginning of the century, many public health initiatives were started and supported by nongovernment organizations. However, as federal, state, and local public health infrastructure expanded, governments' role increased and assumed more responsibility for public health research and programs. Today, public health represents the work of both government and nongovernment organizations.

**Nongovernment organizations.** The Rockefeller Sanitary Committee's Hookworm Eradication Project conducted during 1910–1920 was one of the earliest voluntary efforts to engage in a campaign for a specific disease.[35] During 1914–1933, the Rockefeller Foundation also provided $2.6 million to support county health departments and sponsored medical education reform. Other early efforts to promote community health include the National Tuberculosis Association work for TB treatment and prevention, the National Consumers League's support of maternal and infant health in the 1920s, the American Red Cross' sponsorship of nutrition programs in the 1930s, and the March of Dimes' support of research in the 1940s and 1950s that led to a successful polio vaccine. Mothers Against Drunk Driving started in 1980 by a group of women in California after a girl was killed by an intoxicated driver and grew into a national campaign for stronger laws against drunk driving.

Professional organizations and labor unions also worked to promote public heath. The American Medical Association advocated better vital statistics and safer foods and drugs.[17] The American Dental Association endorsed water fluoridation despite the economic consequences to its members.[9] Labor organizations worked for safer workplaces in industry.[4] In the 1990s, nongovernment organizations sponsor diverse public health research projects and programs (e.g., family planning, human immunodeficiency virus prevention, vaccine development, and heart disease and cancer prevention).

**State health departments.** The 1850 Report of the Sanitary Commission of Massachusetts, authored by Lemuel Shattuck[13,14], outlined many elements of the modern public health infrastructure including a recommendation for establishing state and local health boards. Massachusetts formed the first state health department in 1889. By 1900, 40 states had health departments that made advances in sanitation and microbial sciences available to the public. Later, states also provided other public health interventions: personal health services (e.g., disabled children and maternal and child health care, and sexually transmitted disease treatment), environmental health (e.g., waste management and radiation control), and health resources (e.g., health planning, regulation of health care and emergency services, and health statistics). All states have public health laboratories that provide direct services and oversight functions.[36]

**County health departments.** Although some cities had local public health boards in the early 1900s, no county

health departments existed.[33] During 1910–1911, the success of a county sanitation campaign to control a severe typhoid epidemic in Yakima County, Washington, created public support for a permanent health service, and a local health department was organized on July 1, 1911.[33] Concurrently, the Rockefeller Sanitary Commission began supporting county hookworm eradication efforts.[17,35] By 1920, 131 county health departments had been established; by 1931, 599 county health departments were providing services to one fifth of the U.S. population[33]; in 1950, 86% of the U.S. population was served by a local health department, and 34,895 persons were employed full-time in public health agencies.[37]

**Local health departments.** In 1945, the American Public Health Association proposed six minimum functions of local health departments.[38] In 1988, the Institute of Medicine defined these functions as assessment, policy development, and assurance, and PHS has proposed 10 organizational practices to implement the three core functions.[39,40] The national health objectives for 2000, released in 1990, provided a framework to monitor the progress of local health departments.[41] In 1993, 2888 local health departments**, representing county, city, and district health organizations operated in 3042 U.S. counties. Of the 2079 local health departments surveyed in 1993, nearly all provided vaccination services (96%) and tuberculosis treatment (86%); fewer provided family planning (68%) and cancer prevention programs (54%).[42]

**Federal government.** In 1798, the federal government established the Marine Hospital Service to provide health services to seamen.[15] To recognize its expanding quarantine duties, in 1902, Congress changed the service's name to the Public Health and Marine Hospital Service and, in 1912, to the Public Health Service (PHS). In 1917, PHS' support of state and local public health activities began with a small grant to study rural health.[35] During World War I, PHS received resources from Congress to assist states in treating venereal diseases. The Social Security Act of 1935, which authorized health grants to states, and a second Federal Venereal Diseases Control Act in 1938[13,14], expanded the federal government's role in public health.[15,35] In 1939, PHS and other health, education, and welfare agencies were combined in the Federal Security Agency, forerunner of the Department of Health and Human Services. In the 1930s, the federal government began to provide resources for specific conditions, beginning with care for crippled children. After World War II, the federal role in public health continued to expand with the Hospital Services and Construction Act (Hill-Burton) of 1946.***[15] In 1930, Congress established the National Institutes of Health [formerly the Hygiene Laboratories of the Public Health Service] and the Food and Drug Administration. CDC was established in 1946.[29] Legislation to form Medicare and Medicaid was enacted in 1965, and the Occupational Safety and Health Administration and the Environmental Protection Agency were organized in 1970.

Although federal, state, and local health agencies and services have increased throughout the century, public health resources represent a small proportion of overall health-care costs. In 1993, federal, state, and local health agencies spent an estimated $14.4 billion on core public health functions, 1%-2% of the $903 billion in total health-care expenditure.[43]

## Conclusion

The public health infrastructure changed to provide the elements necessary for successful public health interventions: organized and systematic observations through morbidity and mortality surveillance, well-designed epidemiologic studies and other data to facilitate the decision-making process, and individuals and organizations to advocate for resources and to ensure that effective policies and programs were implemented and conducted properly. In 1999, public health is a complex partnership among federal agencies, state and local governments, nongovernment organizations, academia, and community members. In the 21st century, the success of the U.S. public health system will depend on its ability to change to meet new threats to the public's health.

Reported by: Epidemiology Program Office, Office of the Director, CDC.

## References:


1. CDC. Ten great public health achievements—United States, 1900–1999. MMWR 1999;48: 241–3.
2. CDC. Impact of vaccines universally recommended for children—United States, 1990–1998. MMWR 1999; 48:243-8.
3. CDC. Motor-vehicle safety: a 20th century public health achievement. MMWR 1999;48:369–74.
4. CDC. Improvements in workplace safety—United States, 1900–1999. MMWR 1999;48:461–9.
5. CDC. Control of infectious diseases. MMWR 1999;48:621–9.
6. CDC. Decline in deaths from heart disease and stroke—United States, 1900–1999. MMWR 1999;48:649-56.
7. CDC. Healthier mothers and babies. MMWR 1999;48:849–57.
8. CDC. Safer and healthier foods. MMWR 1999;48:905–13.
9. CDC. Fluoridation of drinking water to prevent dental caries. MMWR 1999;48:933–40.
10. CDC. Tobacco use—United States, 1900–1999. MMWR 1999;48: 986–93.
11. CDC. Family planning. MMWR 1999;48:1073–80.
12. Susser M. Epidemiology in the United States after World War II: the evolution of technique. Epid Reviews 1985;7:147–77.


*(continued on page 18)*

** A local health department is an administrative or service unit of local or state government responsible for the health of a jurisdiction smaller than the state.

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13. Turnock BJ. The organization of public health in the United States. In: Turnock BJ, ed. Public health: What it is and how it works. Gaithersburg, Maryland: Aspen Publication, 1997:1121–68.
14. Last JM. Scope and method of prevention. In: Last JM, Wallace RB, eds. Maxcy-Rosenau-Last Public health and preventive medicine. 13th ed. Norwalk, Connecticut: Appleton & Lange, 1992:11–39.
15. Hanlon JJ, Pickett GE. Public health: administration and practice. 8th ed. St. Louis, Missouri: Times Mirror/ Mosby College Publishing, 1984: 22–44.
16. Koplan JP, Thacker SB, Lezin NA. Epidemiology in the 21st century: calculation, communication, and intervention. Am J Public Health 1999;89:1153–5.
17. Terris M. Evolution of public health and preventive medicine in the United States. Am J Public Health 1975;65:161–9.
18. Vandenbroucke JP. Clinical investigation in the 20th century: the ascendency of numerical reasoning. Lancet 1998;352(suppl 2):12–6.
19. Vandenbroucke JP. A short note on the history of the randomized controlled trial. J Chronic Dis 1987;40:985–6.
20. Doll R. Clinical trials: retrospect and prospect. Statistics in Medicine 1982;1:337–44.
21. Armitage P. The role of randomization in clinical trials. Statistics in Medicine 1982;1:345–52.
22. Doll R, Hill AB. Smoking and carcinoma of the lung. Br Med J 1950;2:740–8.
23. Teutsch SM, Churchill RE, eds. Principles and practice of public health surveillance. New York: Oxford University Press, 1994.
24. Remington PL, Smith MY, Williamson DF, Anda RF, Gentry EM, Hogelin GC. Design, characteristics and usefulness of state-based behavioral risk factor surveillance, 1981–87. Public Health Rep 1988;103:366–75.
25. Kann L, Kinchen SA, Williams BI, et al. Youth risk behavior surveillance—United States, 1997. In: CDC surveillance summaries (August 14). MMWR 47(no. SS-3).
26. Mosher WD. Design and operation of the 1995 national survey of family growth. Fam Plann Perspect 1998; 43–6.
27. CDC. Summary of notifiable diseases, United States, 1997. MMWR 1997;46(no. SS-54).
28. Langmuir AD. The surveillance of communicable diseases of national importance. N Engl J Med 1963; 268:182–92.
29. CDC. History perspectives: history of CDC. MMWR 1996;45:526–8.
30. Roemer MI. Preparing public health leaders for the 1990s. Public Health Rep 1988;103:443–51.
31. Winkelstein W, French FE. The training of epidemiologists in schools of public health in the United States: a historical note. Int J Epidemiol 1973;2:415–6.
32. Association of Schools of Public Health. Enrollment of U.S. schools of public health 1987–1997. Available at http://www.asph.org/ webstud1.gif. Accessed December 14, 1999.
33. Crawford BL. Graduate students in U.S. schools of public health: comparison of 3 academic years. Public Health Rep 1979;94:67–72.
34. Association of Schools of Public Health. Ten most frequently asked questions by perspective students. Available at http://www.asph.org/ 10quest.htm. Accessed December 14, 1999.
35. US Treasury Department/Public Health Service. History of county health organizations in the United States 1908–1933. In: Public health bulletin (No. 222). Washington, DC: Public Health Service, 1936.
36. Altman D, Morgan DH. The role of state and local government in health. Health Affairs 1983;2;7–31.
37. Mountin JW, Flook E. Guide to health organization in the United States, 1951. Washington, DC: Public Health Service, Federal Security Agency, Bureau of State Services, 1951; PHS publication no. 196.
38. Emerson H, Luginbuhl M. 1200 local public school departments for the United States. Am J Public Health 1945;35:898–904.
39. Dyal WW. Ten organizational practices of public health: a historical perspective. Am J Prev Med 1995;11(suppl 2):6–8.
40. Institute of Medicine. The future of public health. Washington, DC: National Academy Press, 1988.
41. Public Health Service. Healthy people 2000: national health promotion and disease prevention objectives—full report, with commentary. Washington, DC: US Department of Health and Human Services, Public Health Service, 1991; DHHS publication no. (PHS)91-50212.
42. CDC. Selected characteristics of local health departments—United States, 1992–1993. MMWR 1994; 43:839–43.
43. CDC. Estimated expenditures for core public health functions—selected states, October 1992–September 1993. MMWR 1995;44: 421,427–9.

## Disease Reporting

Cases of reportable diseases and conditions should be reported promptly to your local health department, or to the Missouri Department of Health at

**(800) 392-0272**
(during working hours)
or
**(573) 751-4674**
(after hours, weekends or holidays)

# April is

## National STD Awareness Month

### Did you know.....

- ☞ At least 15% of all infertility cases in American women are caused by pelvic inflammatory disease (PID), which is usually a complication of sexually transmitted diseases.
- ☞ The sexually transmitted diseases (STDs) most often associated with PID are chlamydia and gonorrhea.
- ☞ According to the Centers for Disease Control and Prevention (CDC), chlamydia and gonorrhea rank first and second among the most commonly reported infections in the United States.
- ☞ Because these infections often have no noticeable symptoms, experts estimate that the annual number of new cases is probably much higher than those reported—4 million cases of chlamydia and 800,000 cases of gonorrhea nationwide.
- ☞ Chlamydia occurs without noticeable symptoms in as many as 85% of cases among women and 40% of cases among men.
- ☞ Young people are at the highest risk for all STDs. Two-thirds of the estimated 12 million new STD infections in the United States each year occur in people under 25; one-fourth occur in teenagers
- ☞ Other possible complications of PID are chronic pain and ectopic, or tubal, pregnancies. In tubal pregnancies, the mother's life is threatened and the fetus cannot develop.
- ☞ Chlamydia and gonorrhea can also cause sterility in men.
- ☞ People who have had unprotected sex should consult a health care provider about getting tested for STDs— even if no symptoms are noticeable. Chlamydia and gonorrhea can be cured with antibiotics, and early detection and treatment of these infections reduces the likelihood of developing PID and its complications.

Source: American Social Health Association

### To find out more.....

- ➤ Talk with your health care provider.
- ➤ Contact the STD clinic in your local health department.
- ➤ Call the National STD Hotline at (800) 227-8922.
  (The hotline is free and open to calls from 7:00 a.m. to 10:00 p.m., Monday through Friday)

Additional information is also available on the Internet at the following sites:

**CDC. Division of Sexually Transmitted Diseases**
http://www.cdc.gov/nchstp/dstd/dstdp.html

**CDC. National Prevention Information Network (NPIN): STD Resources**
http://www.cdcnac.org/std/start.htm

**National Institute of Allergy and Infectious Diseases: NIAID Publications on STDs.**
http://www.niaid.nih.gov/publications/stds.htm

**JAMA. Sexually Transmitted Disease Information Center**
http://www.ama-assn.org/special/std/std.htm

**St. Louis STD/HIV Prevention and Training Center**
http://www.umsl.edu/services/itc/std_ptc.html

**National STD/HIV Prevention and Training Center Network**
http://www.stdptc.uc.edu/

**CDC. Division of HIV/AIDS Prevention (DHAP)**
http://www.cdc.gov/nchstp/hiv_aids/dhap.htm

**CDC. National Prevention Information Network—HIV/AIDS Resources**
http://www.cdcnpin.org/hiv/start.htm

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## LATE BREAKERS

☞ **American Academy of Pediatrics (AAP) Recommends That Newborns Be Vaccinated Against Hepatitis B—**The AAP has issued a statement recommending that all infants receive the hepatitis B vaccination between birth and two months of age. According to Margaret B. Rennels, M.D., F.A.A.P, "Resumption of hepatitis B vaccination of young infants is important because confusion about recommendations has resulted in some hospitals failing to immunize children delivered to hepatitis B surface antigen positive women." Thimerosal-free hepatitis B vaccine is now available, and health care providers should now resume hepatitis B vaccination of infants with thimerosal-free vaccine "optimally at birth and no later than two months of age." Dr. Rennels's article was published in the*AAP News*1999;15(11):6, the official news magazine of the AAP. Dr. Rennels is a member of the AAP Committee on Infectious Diseases.

☞ **Infection Control Guidelines for Long Term Care Facilities: Emphasis on Body Substance Precautions**—The Section of Communicable Disease Control and Veterinary Public Health is pleased to announce that this manual is now available via the Department of Health web site. The web site address is **http://www.health.state.mo.us/Publications/ICtableconts.html**. This manual is in PDF format, so you will need Adobe Acrobat Reader to open it. Hard copies of the manual, with or without a binder, are available at cost. Please contact the Section of Communicable Disease Control and Veterinary Public Health at (800) 392-0272 for ordering information.